

houston instrument corporation



ANY WAVEFORM at repetition rates
down to one cycle every 200 sec.

V.L.F. FUNCTION GENERATOR



TYPE SG88

Calibrated Range

0.005 c/s to 50 c/s

any waveform at repetition rates down to one cycle every 200 seconds



V. L. F. FUNCTION GENERATOR

The SG-88 is a remarkable new instrument based upon a novel optical/mechanical system which combines accuracy with great flexibility of operation. Originally conceived by engineers of Advance Components, Ltd. in England, it is now made and sold under license by Houston Instrument Corporation. It has been designed to fill a gap in the range of laboratory instruments currently available, and is presented as the ideal tool for the solution of many simulation and computer design problems, for microwave system checkouts, for servo-system analysis, vibration testing, and for numerous similar applications.

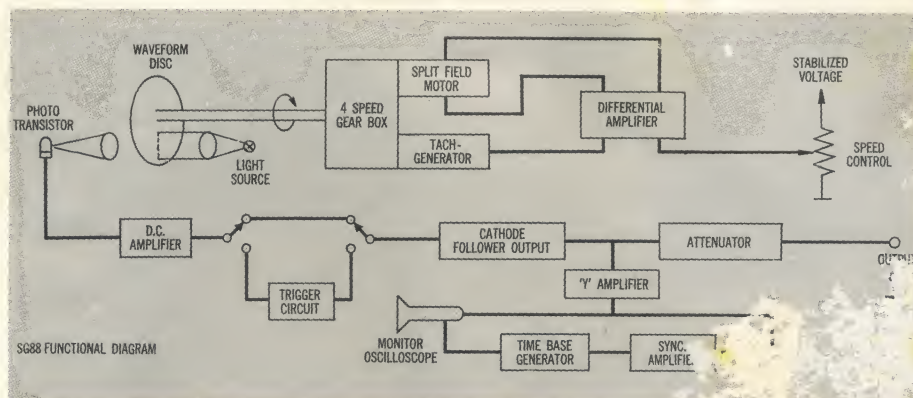
In the SG-88 the conventional oscillator circuit is replaced by interchangeable rotating discs, scanned by a narrow light beam. Printed on each disc is an opaque pattern representing in polar co-ordinates the wave-shape or function to be produced. To achieve frequency accuracy and stability, the chosen disc is driven by a servo-controlled motor via a four-speed gear box.

The range of wave shapes that can be generated is virtually limitless, requiring only that the function from which each is derived is single-valued and repetitive. The direction of rotation of the disc can be changed, thus reversing the time sequence of the output wave form. The output frequency is continuously variable from 0.005 cps up to a nominal maximum of 50 cps. By increasing the number of complete patterns on the disc, the upper frequency limit can be increased to several times the nominal value.

The acceleration of the disc on the two lower frequency ranges is sufficient to permit an almost instantaneous start from any pre-determined point of the waveform, thus allowing effective single stroke operation. To assist in this purpose, the periphery of the disc is calibrated in degrees.

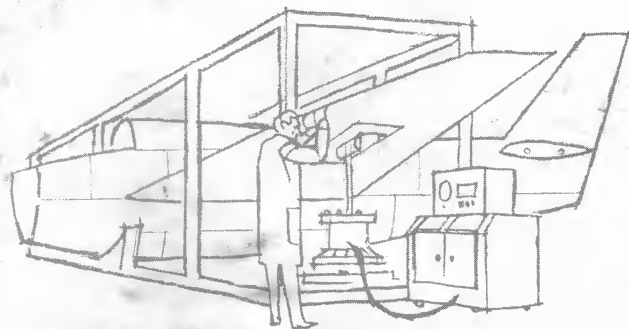
Sweep facilities are provided on the two upper frequency ranges to permit rapid assessment of the response of the equipment under test. The frequency sweep commences at any preset frequency and proceeds logarithmically to the upper frequency limit of the range. For any 10:1 frequency excursion the sweep time is approximately two minutes.

The direct voltage at the output terminals can be set to any value between ± 25 volts from ground level. The waveform (at 40 cps) and output voltage level can be monitored by means of a built-in oscilloscope with a 1 inch diameter C.R.T.



APPLICATIONS

The field of application for the SG88 V.L.F. Function Generator is very wide indeed. For analysis, performance testing and simulation problems on a variety of electronic, electric, electro-mechanical, mechanical, seismographic and medical equipment, the SG88 can prove to be invaluable, performing a function hitherto requiring much time and complex equipment, if indeed it were considered practical at all.



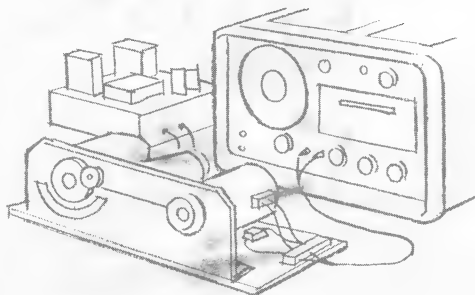
The versatility of the function generator is most useful in the task of investigating and analyzing servo-systems of all types. Servo-mechanisms are now employed in a large number of widely differing applications from automation and machine control to missile guidance, but the development of all these diverse systems can be greatly assisted by use of the facilities provided in the SG88.



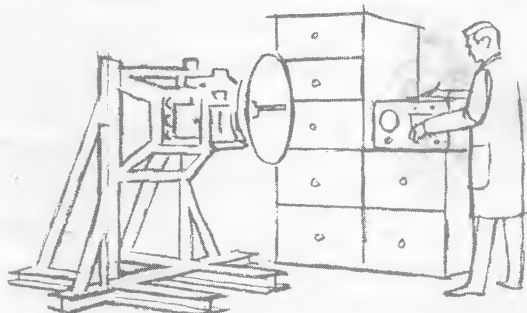
The SG-88 simulator has been tailor-made to provide CUSTOMIZED wave shapes which will checkout any receiving system in frequencies ranging from VHF through KMC regions. It provides a simple, reliable method for checking receiving systems under simulated conditions of fading and other slow changes in received signal. The SG-88 can be used to modulate TWT's or BWO's, VTM's Ferrite Modulator, Diode Modulators, and IF amplifiers so that operation is feasible at all frequencies. This versatile function generator can be used to simulate rotating radar antenna patterns for ECM and reconnaissance applications, telemetry variations during missile flights. Other applications involve simulation of over the horizon links, and studies involving RF spectrum interference.

The design and investigation of analog computers is, for example, greatly facilitated by the use of waveforms which can follow any known law, or are recordings of functions relating voltage and time. The ability to generate an analog of any function opens up a wide range of applications in the simulators of all descriptions. Engine pressure and fuel-flow simulation, physiological simulators for encephalography, respiratory cycle and cardiograph waveforms, are but a few of these.

By virtue of the distributed frequency spectrum when generating white-noise, the SG88 provides an excellent method of vibration study and fatigue testing, permitting a very close approach to actual operating conditions. Alternatively, waveforms representing the load-cycle can be generated, or the sweep facility can be employed to determine frequency resonances and dead spots. This sweep facility is also useful in assessing the limitations imposed by inertia and friction in many types of mechanical equipment.



Demand or process control programming signals are usually cyclic. Whatever the form of the control parameters, pulse sequence, height or width, these factors can be incorporated into the disc design with the basic limitation of a maximum cyclic period of 200 seconds. However, considerably longer cyclic periods than this can be obtained but with decreased accuracy. Many other types of waveforms can be generated, to simulate, for example, heating and cooling cycles in nuclear power reactors, tidal effects in models of harbor installations, and even earthquake tremors for testing and calibrating seismographic equipment.



SPECIAL FEATURES

TIME SEQUENCE

The time sequence of the output can be reversed by rotating the frequency dial from a reading on one side of zero to the same reading on the other side.

SWEEP FACILITY

An automatically controlled drive can be selected so that the output frequency increases logarithmically with respect to time. There is a fixed rate of increase which means that the sweep is more useful on the upper two frequency ranges.

WAVEFORM MONITORING

A small C.R.T. enables the output level to be accurately set and the correct time sequence to be selected.

WAVEFORM DISCS

Five waveform discs are provided with the instrument; three of these generate the standard sine, square and saw-tooth waveforms, and one generates white noise with a bandwidth ratio of approximately 250:1, accommodated anywhere in the frequency range 0.005 c/s to 3 kc/s. The fifth disc is blank, and is supplied to enable the user to construct any other wave-shape that may be required.

In addition to the discs, a number of specially prepared stable blank graphs are supplied, four times the final reproduction size, on which any desired function can be plotted in polar co-ordinates. The degree of discrimination

required determines the number of points to be plotted; for highest accuracy, co-ordinates should be taken at half-degree intervals. From masters so prepared, any number of waveform discs can be produced by the silk-screen printing process.

Customized patterns can be fabricated in less than one hour by a technician with readily available materials providing dramatic savings in development time, test costs, space and power requirements. Eliminates the need for standard transmission systems and range set ups for receiver checkouts.

SPECIFICATIONS

FREQUENCY RANGE: 0.005 to 50 c/s for a single disc, or dependent on number of cycles per revolution. (Lower frequencies possible, but with decreased accuracy). Dial calibrated linearly 0 to 5 and 0 to 10 with four-position decade multiplier $\times 10$, $\times 1$, $\times 0.1$, $\times 0.01$.

FREQUENCY CALIBRATION ACCURACY:

$\pm 1\%$.

OUTPUT VOLTAGE:

200 μ V to 22V, peak-to-peak, high impedance. Selected by a five-position decade multiplier and a continuously variable attenuator.

OUTPUT AMPLITUDE VARIATION:

Within 1 dB over entire frequency range.

RECTANGULAR WAVEFORM RISE TIME:

Varies from 300 ms at 0.005 c/s to 0.3 ms at 50 c/s. When internal triggered device is switched in the risetimes are less than 5 μ s on all frequencies.

OUTPUT WAVEFORMS:

Any single-valued repetitive function. Angular resolution of optical system 0.5° , frequency response of whole system 0 to 3 kc/s.

OUTPUT IMPEDANCE:

At maximum output, 300 to 3000 ohms depending on frequency.

POWER SUPPLY:

105-125V, 60 c/s, 165 watts.

ACCESSORIES:

one power lead
one output lead
one set of waveform plotting charts
four waveform discs for sine, square, sawtooth and noise
one blank disc

OTHER FEATURES:

Direction of rotation of discs can be reversed, so reversing the time sequence (i.e. altering the sign of the differential coefficient). An automatic sweep device can be switched in on the two top bands (0.5 to 5 c/s and 5 to 50 c/s) allowing rapid assessment of amplitude response of equipment being tested. Sweep time is approximately 2 minutes for any 10:1 frequency excursion.

DIMENSIONS:

19 $\frac{1}{2}$ in. \times 13 in. \times 15 in.

WEIGHT:

80 lb.; 100 lb. shipping.



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